Manitoba
Hazardous Waste
Management Corporation

226 - 530 Century Street Winnipeg, Manitoba R3H 0Y4 Telephone: (204) 945-1844

THE DEVELOPMENT OF A HAZARDOUS WASTE MANAGEMENT SYSTEM IN MANITOBA

R. J. Cooke
Chief Executive Officer

MANITOBA HAZARDOUS WASTE MANAGEMENT CORPORATION

August 1988

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THE DEVELOPMENT OF A HAZARDOUS WASTE MANAGEMENT SYSTEM IN MANITOBA

1.0 INTRODUCTION

This paper is intended to provide an overview of the subject of hazardous waste and to describe the progress toward the development of a comprehensive system for its management in Manitoba. In addition, it discusses a number of issues which are fundamental to this development.

In the paper, the subject of hazardous waste as an environmental and social issue is introduced. The history of interest in the subject is summarized with specific reference to experience in Europe, the United States and elsewhere in Canada. This is followed by a more detailed description of what has occurred in Manitoba and the role currently assumed by the Manitoba Hazardous Waste Management Corporation. It concludes with the discussion of a number of current public policy issues relating to the development of a hazardous waste management system in Manitoba.

2.0 THE HAZARDOUS WASTE ISSUE

Modern societies with industrial and resource based economies generate a significant quantity of waste material. A portion of this material is harmful to the biophysical environment and, in some cases, to human health, when disposed of in a random or uncontrolled manner. In addition, it is a cumulative problem with the impacts building up over time and finally being manifest as major or even catastrophic events having significant environmental, social and/or economic implications.

The materials considered to be "hazardous" or "special" wastes include a wide range of substances extending from well publicized chemicals and contaminants such as dioxins or PCB's to relatively common materials such as solvents, cleaners, petroleum products and paint residues. While several obviously dangerous classes of these materials (i.e. radioactive and explosive) have been exclusively controlled by the federal government for a number of years, it is only relatively recently that most such substances have received any special attention. Currently, they are regulated by provincial authorities with the federal government providing uniformity through the Transportation of Dangerous Goods Act (1) and the new Canadian Environmental Protection Act (46).

Current national regulations (1) define 3126 different hazardous materials in general use under the international classes listed in Table 1 with typical examples. The number of such materials can be expected to grow as a result of both technological advancement and economic growth. As evidence of this, it is estimated that over 50,000 commercial chemicals are currently produced by North American industry, with this increasing by about 2,000 each year (2). In the future, this number is expected to grow even more dramatically with the addition of products from the emerging technologies. Only a small proportion of either new or existing materials have been fully assessed as to their impact on environmental quality and human health. However, the capacity and the legislative requirement to do so is increasing (46). This will inevitably lead to more materials being classified as hazardous and the resultant wastes requiring competent treatment and disposal.

In terms of quantity, it is estimated that 2,763,000 tonnes of provincially regulated hazardous waste are generated in Canada on an annual basis (3). The estimated regional distribution of this waste is illustrated in Table 2. While the largest proportion is generated in Central Canada, particularly Ontario, all regions contribute significant amounts. Estimates for Manitoba, based on the province's economic characteristics and population, would suggest that 33,300 tonnes/year are generated (3). It should be noted that these estimates are dated and do not reflect current regulation or awareness. The extrapolation on the basis of population of more recent data from Ontario (12), where the most detailed survey work has been done, suggests that actual quantities may be twice those stated above.

TABLE 1

CLASSES AND EXAMPLES OF COMMON HAZARDOUS MATERIALS

Class	Name	Example
2	Gases	Aerosols, Ammonia solutions, Carbon dioxide, Coal gas, Compressed gases, Methane, Oil gas, Propane, Vinyl chloride.
3	Flammable Liquids	Acetone, Adhesives, Alcohols, Brake fluid, Gasoline, Kerosene, Printers ink, Paints, enamels, lacquers, stains, varnish & polishes, Liquid tars, Liquid wood preservatives, Turpentine
4	Flammable Solids	Alkali metal alloys, Metal alkyls, Aluminum powder, Barium alloys, Calcium hydride, Camphor, Celluloid, Charcoal (activated), Fertilizer ammoniating solution, Iron oxide, Lithium batteries, Matches, Nickel catalyst, Rubber scrap, Textile waste, Zinc powder.
5	Oxidizing Substance & Organic Peroxides	Aluminum nitrate, Ammonium nitrate fertilizers, Calcium chlorite, Calcium nitrate, Benzoyl peroxide, Hydrogen peroxide, Lead dioxide, Medicines, Potassium nitrate, Sodium nitrate.
6	Poisonous & Infectious	Aerosols, Arsenic compounds, Cresols, Cyanides, Disinfectants, Dyes, Infectious substances (human & non-human), Medicines, Mercury compounds, Motor fuel anti-knock mixtures, Organic phosphate compounds, Phenols Pentachlorophenol, Pesticides.
8	Corrosives	Acrylic acid, Aerosols, Ammonia solutions, Batteries (with acid), Battery fluid, Caustic potash, Caustic soda ash, Corrosive liquids, Sodium chlorite solution.
9	Miscellaneous Substances	Aerosols, Aluminum sulphate, Ammonia solutions, Ammonium nitrate fertilizers, Asbestos, Chlordane mixtures, Dichlorobenzene Dieldrin, Heptachlor, Methoxyclor, Polychlorinated biphenyls, Strychnine mixtures, trichloroethylene, 2,4,5-T

NOTE: Products and substances, including waste materials in Class 1, Explosives and Class 7, Radioactives, are classified and controlled by the Explosives Act (Canada) and the Atomic Energy Control Act (Canada) respectively.

TABLE 2

HAZARDOUS WASTE GENERATION
BY PROVINCE IN 1982
(Tonnes)

Province	1982 Population	Total Hazardous Waste Generated (Tonnes)
Alberta	2,345,500	87,500
British Columbia*	2,837,700	66,300
Manitoba	1,049,600	33,300
New Brunswick	709,200	46,900
Newfoundland	580,800	20,700
Nova Scotia	863,000	106,800
Ontario	8,854,700	1,407,800
Prince Edward Island	124,500	400
Quebec	6,530,000	951,900
Saskatchewan	997,400	42,200
TOTAL	24,892,400	2,763,800

*Includes the Territories

(Source: Proctor & Redfern et al, 1984)

The most current direct survey data for Manitoba indicates that approximately 20,000 tonnes/year is available for treatment and disposal (4). This number differs from that quoted above as it is based on data collected from specific waste generators who would be expected to present their wastes for treatment (i.e. capturable waste). However, like the 33,300 tonne estimate based on demograghic and economic characteristics, it does not reflect current regulatory and social attitudes.

In the past, we have not been particularly discriminating in the manner in which wastes have been manged. The result has been that the vast majority of hazardous wastes have been disposed of in municipal landfills and sewer systems or by direct release to the land or surface water (4). It is only recently that waste management at source through reduction, reuse, recycling and recovery, or using off site treatment and disposal facilities specifically designed for this purpose.

Historically, a number of barriers to the adequate handling of these wastes have existed, including:

a) Poor awareness and lack of urgency attached to the problem

b) Absence of regulation and enforcement

c) Lack of appropriate treatment and disposal facilities

d) Economic impediments to proper management.

Poor awareness of the hazardous waste issue was the major reason for the relatively recent realization that a problem exists. This has largely been overcome in the last decade with the growth in society's sensitivity to health, safety and environmental values. Also contributing to public awareness is the occurrence of widely publicized events related to such things as the discovery of toxic waste dumps, mercury poisoning and accidental chemical spills. However, there still remains a tendency toward minimizing the urgency of taking action unless there are highly visible impacts. In effect, a societal choice exists between a preventive approach through anticipatory action (i.e. education, regulation, provision of facilities) or waiting until the problems become visible prior to taking remedial action.

Absence of regulation covering hazardous wastes has been a traditional barrier. It is an unfortunate fact that sanction and control are required to stimulate action by waste generators as well as to ensure that the responsible generator is not placed at an economic disadvantage. However, the basic regulatory framework is now being established in most jurisdictions in Canada, albeit with variations in comprehensiveness and consistency (5). In this context it is important to recognize that the existence of regulations must also be supported by the capability to enforce them. Unfortunately, effective enforcement is often limited by the resources available to do so and by the availability of adequate treatment and disposal alternatives.

Lack of appropriate treatment and disposal alternatives restricts effective waste management. Although regulations requiring the proper treatment and disposal of hazardous materials have been coming into effect, few facilities providing this service are available, and access to them has been limited by jurisdictional and economic barriers. These include the high initial capital cost and business risk involved, the difficulty in siting and approving facilities at a local level and uncertainties as to long term public policy.

Economic impediments exist because the costs of proper management are substantially higher than those incurred previously using traditional practices. These costs may significantly alter the basic economic viability of a waste generating enterprise. In turn, this raises questions related to how these costs are distributed equitably so that economic development is not negatively or unfairly impacted. Furthermore the costs of providing the proper management capability are significantly affected by economies of scale with the result that areas such as Western Canada are less able to provide cost effective solutions than more populated regions.

In the following these barriers are addressed in detail by examination of the experience of others in pursuing solutions to the hazardous waste problem and the public policy and business issues that are involved. This is done in the context of developing an effective hazardous waste management system in Manitoba.

3.0 RESPONSE TO THE ISSUE ELSEWHERE

3.1 General

The general response to the hazardous waste problem has been to address some or all of the above barriers. Government, industry and the public have developed some degree of recognition that a problem does exist and that collective action is required to address it. This collective action has typically involved two aspects. Firstly, the mechanisms to control hazardous wastes and their management through regulation have been pursued. Secondly, the development of a dedicated management capability to recycle, recover, reuse, reduce, collect, transport, store, analyze, treat and dispose of these materials has been addressed. The coordinated management capability encompassing both aspects and inclusive of the necessary infrastructure and the facilities to accomplish this, comprise what is referred to as a "Hazardous Waste Management System."

As noted above, most jurisdictions have established regulatory controls, sponsored awareness programs with many have established source based waste reduction initiatives. A number have also started the development of specifically designed treatment and disposal facilities as part of putting an overall system in place. The following provides a summary of facility and system development in Western Europe, the United States and other Canadian provinces. This is followed by a more detailed description of the current situation in Manitoba.

3.2 Western Europe

The problem has been evident in Western Europe for some time due to the region's high level and long history of industrialization. Therefore, it is not surprising that this area has been the most advanced, both in terms of control measures and the provision of facilities (6). This is particularly true in Northern European countries where operational hazardous waste management systems providing a complete range of services have been in existence for at least 10 years in Denmark and West Germany. More recent capability has been developed in Sweden and Finland. In addition, these countries have specialized capability for specific industries and waste streams. A comprehensive or integrated capability in other European countries is less developed, although commercially operated specialty facilities do exist in France, the United Kingdom and Italy.

Most of the fully integrated facilities, providing a complete range of treatment and disposal capability, are publicly operated with equity participation by municipalities, senior governments and, in some cases, the generating industries. All have been publicly subsidized at least with respect to capital costs. Generally the integrated facilities are operated as utilities with the user fees being set on a regulated or quasi-regulated basis to ensure social and economic accountability, as well as to recover operating costs.

3.3 United States

The management of hazardous waste is currently viewed as a major priority in the U.S., with substantial levels of federal funding and regulatory resources being directed toward the problem. Likewise, many states are actively pursuing the establishment of facilities and a large commercial waste management industry has developed to supply technology and services.

The problem in the U.S. is viewed as having two dimensions. The first is the control and adequate management of wastes as they are generated. The second relates to the clean up or remediation of the results of past practice.

The annual generation of non-radioactive hazardous wastes in the U.S. is estimated to be approximately 50 million tonnes per year or approximately one pound per person per day (7). In recent years, hazardous waste has been subject to increasingly stringent regulation and, associated with it, the assignment of major long term liabilities to the waste generator. However, the capacity to effectively manage this volume of material in off-site facilities remains generally short of the demand due to the difficulty in siting such facilities and the difficulty in obtaining approvals for current technologies. The result is a major move on the part of waste generators toward source based waste management, either through conservation oriented measures (reduction, recycling, reuse, recovery) or on-site treatment and disposal.

The remediation of sites where hazardous wastes have been disposed of in the past is also a major priority in the U.S. As of October 1986, 25,000 sites, potentially requiring remediation, have been reported with 888 of them being proposed or designated as national priorities for action and so called "Superfund" action (8). This fund was originally set at $1.6 Billion in 1980 with financing through selective taxation of crude oil and certain chemical products. In 1986, the fund was increased to $8.5 Billion for a five year period in recognition of the problem's magnitude (9). It is currently estimated that the eventual remediation costs in the U.S. will be $300 Billion (10).

With respect to facilities offering hazardous waste management capability, a wide range are available on a commercial basis including incinerators, physical/chemical treatment plants, stabilization facilities and landfills (11). However, few of these facilities can provide a fully integrated service. Moreover, the use of hazardous waste landfills, which has been the most common method of management, is being discouraged where pretreatment and stabilization are not provided for. Complicating the reduced availability of landfills is the difficulty in developing more modern facilities due to siting opposition and to the complicated regulatory approval process required. The combination of any increasing need for facilities and the hesitancy of private operators to pursue new facilities has resulted in state governments stepping in to develop publicly sponsored facilities, often on a joint venture basis with competitively selected commercial operators.

3.4 Canada

In Canada, the response to the issue has been relatively recent, with serious regulatory initiatives starting in the late 1970's and still remaining under development in many jurisdictions (5). Similarly, the development of treatment and disposal facilities is relatively new and is described in the following.

A major distinction of the Canadian process of facility development, in comparison with that of the U.S., has been the role of public enterprise as the initiator and proponent. Provincial governments, through their own commercial or quasi-commercial agencies rather than the private sector, have taken the lead in acting as the proponents of such facilities. In part, this reflects the Canadian tradition of using public enterprise as a vehicle for providing collective services for the public good. It also reflects the reluctance of the private sector to take risks in this area, particularly when the size of the waste market and the potential for economic

returns are relatively small. In addition, it is generally recognized that such facilities will be controversial and require a high level of public support to succeed. Government agencies have been perceived to offer a greater measure of public accountability and therefore a greater chance of success.

a) Ontario

Due to its proximity to the U.S. industrial heartland and its own heavy industrialization, Ontario began addressing the hazardous waste issue relatively early. Initially the process paralleled U.S. experience with the establishment of a number of privately operated commercial facilities. Currently, these include a large scale liquid incineration plant, physical/chemical treatment and secure landfill in Sarnia, operated by Tricil, and several smaller specialized physical/chemical treatment facilities in the Toronto/Niagara area. These facilities are among the best available from a technical perspective and constitute a major portion of the capability in Canada at this time. However, they are oriented toward the most profitable waste streams and command premium rates due to lack of competition. In addition, current capacity is substantially less than the volumes generated and many wastes, particularly contaminated solids, cannot be handled.

The need for greater and universal capability led the provincial government to form a Crown Corporation in 1982 to develop a large scale, fully integrated facility for the province. The Ontario Waste Management Corporation (OWMC) has undertaken an extensive technical and environmental assessment program toward this end. The Corporation has completed the preliminary design of a 150,000 tonnes/year facility, selected a proposed site in the Niagara area and has submitted an Environmental Impact Assessment to the Ministry of the Environment for approval to proceed with construction. Due to the complexity of this proposal and public opposition to the site, the approval process will take several more years. Completion of the facility is currently scheduled for 1992/93 (12). Expenditures to date are approximately $60 Million with the final estimated capital and development costs being $250 Million (13).

It is anticipated that the facility will be publicly owned and operated. While no specific financial model has been adopted, the current thinking favors the write off of the development costs as a grant, conversion of costs of physical assets to crown equity and the recovery of operating costs from user fees established to provide equitable access to the facility regardless of the generators size or distance from the facility. It should be noted that OWMC is specifically designed to be the "treater of last resort". The profitable waste market will be left to private commercial operators. In addition, OWMC intends to use user fees as a public policy tool to promote source based waste management. As a result a significant degree of public financial support is anticipated.

b) Quebec

In Quebec, one major private commercial facility (Stablex), providing physical/chemical treatment, waste stabilization and landfill services, has been operating since 1983. While initially uneconomic due, at least in part, to the absence of regulations in the province, it is currently being sustained by the importation of material from the U.S. and other provinces (70% of

their market) (14). A privately operated rotary kiln incinerator is also under consideration for the Montreal area but the date that it will be available is uncertain at this time. No plans exist for the development of a universally accessible public facility.

c) Alberta

Based on public hearings and Alberta Environment studies (15,16), the Alberta Government initiated the siting of a fully integrated facility in 1982, under the auspices of a Crown corporation, the Alberta Special Waste Management Corporation (ASWMC) (17). The actual facility development was undertaken as a joint venture with a private company, Chem-Security Ltd. (CSL). The 20,000 tonnes/year facility is located in North Central Alberta near Swan Hills and consists of an incineration plant, physical/chemical treatment plant, stabilization capability and landfill plus the necessary administrative, technical and environmental monitoring infrastructure (18).

It was completed and officially opened in September 1987. Upon completion of licensing test burns on the incineration facilities in the summer of 1988, it will be fully operational. The capital cost of the facility was $50 Million, with approximately $15 Million having been spent on support infrastructure and general development costs. Additional expenditures of $5 to $15 Million for facility additions and the development of a collection system are contemplated (19).

The facility is jointly owned by ASWMC (40%) and CSL (60%) with CSL being the operator. The Crown corporation owns the site and effectively assumes all liability risks for the undertaking. CSL has a guaranteed rate of return on its investment based on a rate base, the prime rate and the combined federal/provincial tax rate. As an example this rate of return was calculated at 13.1% in 1986. In addition, CSL is provided with backstopping for shortfalls in revenue to cover their operating costs (20). In effect all financial risks remain with the province.

While this facility is the first fully integrated plant in Canada, it is not available on a commercial basis to any wastes generated outside of Alberta. Alberta has opted to close its borders to waste imports. Initial market response to the facility suggests that the facility may be oversized for the Alberta market. This, coupled with high initial operating costs and a rate structure tied to market rather than cost, has resulted in initial operating deficit. During the current year, an overall operating subsidy of $16 Million has been estimated, $5.7 of which has already been allocated on an emergency basis (19,21). It is expected that an improvement in performance will result from expanding markets created by the enforcement of newly established regulations and the possibility of importing waste to the province. The latter is not assured given the public commitment of the government to restrict access to the facility to provincial wastes. In any event, it will only be feasible if the facility is competitive with commercial operations in Ontario and the U.S.,

d) British Columbia

The development of facilities in B.C. was first initiated in 1983 by a private company (Genstar) that proposed the utilization of an existing cement kiln coupled with new treatment and disposal facilities. This initiative was shelved due to siting difficulties, and lack of both supporting regulations and government policies related to market access.

In 1987, the provincial government started a new initiative through an appointed commission charged with the task of selecting a private proponent. The basis of this initiative was that no public funding be provided, the site had to be acceptable to the community in which it was located, the facility had to accept all waste, and no net import of waste to the province would be allowed. In turn the province would provide the facility with priority access to the market, facilitate an expeditous environmental regulatory approval process, and assist in locating a host community (23, 24).

The result of this process was the selection of a group known as B.C. Special Waste Services Inc. (a joint venture of Envirochem Services, Sandwell Swan Wooster, Ensco and Stablex) in early 1988. Currently this group is looking for a site under the sponsorship of the Commission and expects to have a facility in operation in late 1989. The estimated cost of the facility itself is $15 Million excluding the collection system, site costs, support services and closure costs. The latter costs are estimated to be $5 Million and will be publicly funded by a yet undetermined mechanism. No subsidies of operation are contemplated. The operator will charge market prices for the service. A further caveat on the development is that the permanence of the facility is dependant on the availability of waste either from B.C. or through allowance of imports. If the supply of wastes is not sustainable, the treatment equipment will be removed at the operator's option (23, 25).

e) Other Provinces

Most other provinces in Canada have initiated preliminary studies related to facilities but none (except Manitoba) has pursued facility development. Most have concluded that the market is too small to sustain a facility and are hoping to obtain access to facilities elsewhere at whatever economic penalty this would entail. One, Nova Scotia, has gone as far as proposing the development of a privately operated collection system servicing the Maritimes and directing its wastes to Central Canada or the North Eastern U.S. (26). Saskatchewan has indicated some interest in access to facilities in either Manitoba or Alberta (27). In all these cases, the development of an effective regulatory infrastructure has been limited, a step that will have to be taken if a commercial capability is to be developed.

4.0 MANITOBA HAZARDOUS WASTE MANAGEMENT PROGRAM

4.1 BACKGROUND

Interest in the issue in Manitoba dates from the early 1970's. The Department of Environment and Workplace Safety and Health and its predecessors initiated several programs in this area related to such things as pesticides and chemicals in institutions. Among other things, this work involved the establishment of a temporary hazardous waste storage facility at Gimli which has been available for pesticide residues and various chemical wastes collected through public programs operated by the regulatory authorities. This facility remains in operation with wastes being periodically disposed of by contracting with commercial operators.

Also of note was the action taken by Manitoba Hydro in the early 1980's respecting the treatment and storage of PCB's. Hydro installed a chemical treatment facility to process contaminated oils, and have a long term program to remove all such contaminants from their system as well as provide limited services to others (22). Manitoba leads the country in the volume of low level PCB contaminated material treated (28). Hydro also operates a PCB storage facility for materials that they cannot treat. Limited access to these facilities is available to private and institutional generators of this material on a cost recoverable basis.

Examination of the hazardous waste issue began in a systematic way in 1982 with the initiation, by the provincial government, of a long term multi-phase hazardous waste management program (4). While Manitoba did not have the highly visible and controversial problems emerging in other more industrialized areas, the provincial government recognized that the development of such situations was only a matter of time. In anticipation of this eventuality, the process of establishing a planned and comprehensive waste management system for the province was started. The program was designed to occur in three distinct phases:

a) Phase I - Develop an Information Base

b) Phase II - Design and Propose a System

c) Phase III - Implement and Operate the System

The Program was to encompass the reduction of hazardous waste through reuse, recycling and recovery, as well as its treatment and disposal. In addition it is recognized as requiring a very high level of public participation and input.

The first phase of the program was pursued from 1982 to 1987. It focused on the development of public awareness through a series of public hearings (29,30) and a public symposium involving a wide range of interested parties (31). In addition, the Department of Environment and Workplace Safety and Health conducted a number of preliminary technical studies on the nature of the wastes generated in the province, the types of facilities that might be developed and a preliminary economic analysis of various generic facility options (4,32,33,34). At the same time, the basic regulatory framework for the control of hazardous waste was established (48). A listing of the relevant legislation and regulations is provided in Table 3. Phase I culminated in mid-1987 with the release of the final report of the public hearings held by the Clean Environment Commission (30).

The general results of Phase I may be summarized as follows:

a) A preliminary estimate indicated that 20,000 tonnes/year of hazardous waste will be available to the provincial management system.

b) The estimated distribution of waste indicated a concentration in Winnipeg (40 %) and in the neighboring eastern (23%) and western (25 %) regions of the province.

c) 75% of the waste was estimated to consist of inorganic materials. Organic waste accounted for the remaining 25 %.

d) It was recognized that the estimated quantity, distribution and waste type requires verification, particularly with respect to the actual amounts and types of waste that a system will ultimately see when the impact of both regulatory enforcement and source based waste management are better known.

e) The present disposition of these wastes is primarily to municipal sewer and landfill facilities. Direct treatment, storage or recycling account for a small proportion of wastes generated.

f) A public consensus exists that a management system for hazardous waste is required in the province.

g) The proponent of the overall hazardous waste management system should be a commercial public corporation operating independently from the regulatory authorities.

h) The specific form that the system should take requires further study, particularly with respect to its sizing, the technologies required, the economic basis under which it will operate and the location of its facilities.

4.2 MANITOBA HAZARDOUS WASTE MANAGEMENT CORPORATION

As noted above, it was recognized during Phase I of the program that a proponent, independent of the regulatory authorities, would have to exist for the development of the system to proceed into Phase II. During Phase I, the Department of Environment and Workplace Safety and Health acted in both the capacity of regulator and proponent. However, once a system was to be pursued in detail, the two roles would have to be split to avoid an inherent conflict of interest.

The choice of a public corporation as this development vehicle was made in part by the absence of any private sector alternatives. The choice was consistent with the preference of virtually all interested parties who expressed their views during the Phase I Clean Environment Commission hearings (29,30). Other supporting rationale reported at this time included a need to coordinate various system components, the coverage of liabilities inherent in the undertaking, assurance of equitable and universal access, provision of system security and continuity, public accountability and the need for public funding.

TABLE 3

LISTING OF MANITOBA HAZARDOUS WASTE

LEGISLATION AND REGULATIONS

1. The Environment Act
2. The Dangerous Goods Handling and Transportation Act
3. Manitoba Regulation 172/85 Respecting the Handling, Offering For Transport and Transporting of Dangerous Goods
4. Manitoba Regulation 141/87, Amendment to MR 172/85
5. Manitoba Regulation 175/87, Generator Registration and Carrier Licensing Regulation
6. Manitoba Regulation 282/87, Respecting Classification Criteria For Products, Substances and Organisms
7. Manitoba Regulation 439/87, Environmental Accident Reporting Legislation
8. Manitoba Regulation 139/88, Manifest Regulation
9. Manitoba Regulation 140/88, Generator and CArrier Licensing Regulation, Amendment to MR 175/87

The Corporation was created with the passing and proclamation of the Manitoba Hazardous Waste Management Corporation Act in November 1986 (35). It was established as a commercial Crown corporation, reporting through its Board of Directors to a responsible Minister with its equity held by the Minister of Finance. Initial financing is provided through the provincial Loan Act with a maximum contemplated capital borrowing authority of $35 Million.

Its mandate is to plan and operate a hazardous waste management system which will safely dispose of hazardous waste in accordance with regulations and standards prescribed by the Minister of Environment and Workplace Safety and Health. This is to be done through the coordination of the various elements of the system, which may include collection, transfer, storage, treatment and disposal of waste as well as the promotion and facilitation of waste management at source. It is to be accomplished in an efficient, dependable fashion, impacting positively upon the provincial economy and giving priority to hazardous wastes generated in Manitoba.

The objectives of the Corporation, as set out in Section 3 of the Manitoba Hazardous Waste Management Corporation Act, are as follows:

(a) to establish, operate and maintain in accordance with all applicable laws in the province, a hazardous waste management system in Manitoba;

(b) to research, develop, establish, own, operate and maintain facilities for the transmission, reception, collection, examination, storage, treatment, recycling and disposal of hazardous wastes;

(c) to ensure that the hazardous waste management system is established, operated and maintained in a manner that will protect the health and safety of the public and preserve the environment;

(d) to ensure the protection of health and safety of the public and the preservation of the environment following the closure of the hazardous waste management facilities established as part of the system.

For purposes of fulfilling its mission and objectives, Section 4 of the Act provides the following powers:

(a) acquire, own, develop, produce, process, recycle, treat, manage, utilize, conserve, store, transport or otherwise deal in or with hazardous wastes;

(b) sell or otherwise dispose of any product produced in conjunction with the generation, treatment, processing or recycling of hazardous wastes;

(c) participate with others in the activities mentioned in clause (a) to carry on joint operations with the other participants;

(d) subject to this Act, acquire, hold, mortgage, alienate or otherwise dispose of land and any interest therein;

(e) carry on any other business incidental to the business carried on by the Corporation calculated directly, or indirectly to enhance the value of, or render profitable, any of the property or rights of the Corporation.

In August 1987, the Corporation became operational with the hiring of its first staff. Since that time it has established itself as an independent organization having a professional staff of eleven recruited from both the private and public sector. The maximum staff level projected during the system's feasibility and planning phase is fifteen. As is described in the following section, the first task undertaken by the Corporation has been the development of an overall strategic plan for the system and the initial implementation of this plan. At this time the Corporation is assuming operating responsibility for a number of existing provincial hazardous waste management programs, has established a generator services program aimed at source based waste management and initiated detailed studies related to facilities development, waste market characterization and facility siting. This work is targeted toward the submission of a detailed facility and business plan in late 1989 for regulatory and capital funding approval.

The Corporation's 1987 budget was $350,000 including funding of a number of established program and grant obligations administered by the Department of Environment and Workplace Safety and Health. The approved 1988 budget is $2,131,700. The projected 1989 budget for system planning to the point of seeking approvals to proceed is $1,971,000. Total projected expenditures for the feasibility stage of the system development process are $4,456,200. Limited additional expenditures related to expansion of present publicly supported waste management programs and equity investments in joint venture opportunities related to source based waste management may also be proposed in this period.

4.3 SYSTEM DEVELOPMENT STRATEGY

As noted above, the first task undertaken by the Corporation was the formulation of a long term strategic plan for the development of a provincial hazardous waste management system. Using the results of the overall program's first phase and a careful review of experience elsewhere, a basic approach has been established and is being pursued. The following outlines this plan, and presents the rationale behind it.

The basic requirements of the system can be defined as:

a) It must provide for the management of these wastes in a manner that protects human health and safety and environmental quality.

b) It should be universally accessible in that it will handle all provincially generated and regulated hazardous wastes presented to it.

c) It needs to begin providing services as soon as possible, since regulations are now in place, and the principle environmentally sound alternatives to generators are high cost out-of-province commercial operators.

d) It should encompass the complete spectrum of waste management options with the first priority attached to the management of waste at source through reuse, recycling, recovery and reduction.

e) It must be affordable to its users in that its costs do not unduly penalize compliance with regulation, discourage use and/or impose economic disadvantage.

f) It must be accessible on an equitable basis within the province such that service is provided on the same basis regardless of waste generation location or amount of waste produced.

g) It must be affordable to the taxpayer in recognition that the public financial resources available for it are limited and therefore, it must be developed and operated with the optimum level of public expense, financial risk and control.

h) Its development must be pursued with a high degree of public involvement, input and acceptance.

Examination of the experience elsewhere shows that a number of constraints or risks exist in attempting to satisfy these requirements and these need to be addressed in the plan adopted. More specifically, the lessons learned from this experience include:

a) It is difficult to predict the actual size of the waste market prior to developing facilities, leading to the risk of incorrect sizing and facility duplication.

b) A significant portion of the potential market is most economically serviced by source based waste management strategies.

c) The economic viability of the system is enhanced by maximizing the size of the market accessed and is limited by restrictions on movement of waste between jurisdictions.

d) To be economically viable, a system accepting all waste presented to it (i.e. a universal system) must have access to more profitable waste streams and the revenues that may be generated through source based waste management in order to offset the cost of servicing small and remote generators.

e) A degree of public financial support will likely be required for any universally and equitably accessible system in the form of initial capitalization, provision of infrastructure, liability coverage and subsidy of some waste streams.

f) System viability requires the existence of a comprehensive regulatory infrastructure, including enforcement capability.

g) The ability to successfully locate and operate facilities requires the development of public acceptance and understanding at a local level as well as the sustained public policy commitment of governments.

h) The time to put a system in place will range from a minimum of 5 years to in excess of 10 years, depending on the level of public acceptance and the sustainability of public support.

In summary, it was concluded that for the Corporation to satisfy the above system requirements and at the same time provide a cost effective system within a reasonable time frame, a different approach than that adopted by others was warranted. A characteristic of virtually all other similar undertakings has been to focus from the outset on the development of a dedicated facility providing a complete range of treatment and disposal capability. This has required commitment to a significant capital outlay and specific technologies early in the development process, usually prior to an accurate estimate of the market or the potential returns being available.

As an alternative, the Corporation has opted to pursue the development of the system incrementally, on a component by component basis, from the waste source forward. This involves placing a high priority on waste reduction at source in order to identify waste streams that can be most economically dealt with by the generators as well as those that are best dealt with in collective treatment and disposal facilities. This approach serves to enhance the conservation ethic, provides the most economic solutions to many waste streams, places reasonable costs with the generator and perhaps most importantly identifies those wastes that need not be accommodated in the new facilities to be developed for collective waste management.

To respond to the near term need for a collective waste management capability, the Corporation is focusing its initial facility development work on investigation of collection, storage and volume reduction capability rather than on full scale treatment and disposal facilities. This can be provided relatively quickly and at a lower initial capital cost.

However, in contrast to the more traditional approach of committing to a fully integrated treatment and disposal capability from the outset, the Corporation will defer this step until a more accurate characterization of the market is available, out of province disposal options are tested and a full assessment of appropriately scaled technologies has been done. In this way options that may allow for the optimization of the system will not be precluded.

With respect to the selection of technologies, the Corporation's approach gives recognition to the fact that those available and their economic scale and flexibility are changing rapidly. Until recently the options available were largely limited to large scale fixed based processes for thermal and physical treatment of waste, supported by modifications of conventional landfill technologies for residue disposal. However, the potential exists within the development time frames envisioned for the system to explore and utilize a number of smaller scale and/or transportable treatment technologies that are gaining acceptance in source based waste management and site remediation applications. Such technologies, coupled with appropriate site infrastructure planning, may offer the flexibility necessary for cost effective incremental development as well as the ability to utilize the most current proven technology as the need is identified.

The physical development of the system is planned to occur in three stages. Stage 1 involves undertaking the necessary study, design, assessment and market development work such that a concrete proposal for the first increment in the system's facilities can be put forward for the appropriate regulatory and financial review. In this stage, study work will also be undertaken related to market and business options, the provision of services to waste generators where not currently available, facilitation of source based waste management initiatives and conceptual level work on the configuration of the overall system.

Stage 2 will involve the building and start up of the "basic system facilities" planned and approved in Stage 1. In addition, the more detailed study, design, and assessment work necessary for the "full system facilities" will be undertaken such that a formal proposal for their implementation can be made. Stage 3 will involve building the full system.

With respect to overall timing, Stage 1 will be completed and Stage 2 will begin in early 1990 with the receipt of the necessary regulatory and funding approvals for the basic system development. Stage 2 will be completed in 1991. Assuming that dedicated treatment and disposal facilities are justified, these will be constructed in Stage 3 with completion as early as 1993. Figure 1 provides an overall schedule for the system's development as currently planned. It should be noted that this schedule is optimistic, given the experience of others. It depends on the timely receipt of both regulatory and financial approvals, as well as the maintenance of a high level of public acceptance, particularly at the local level.

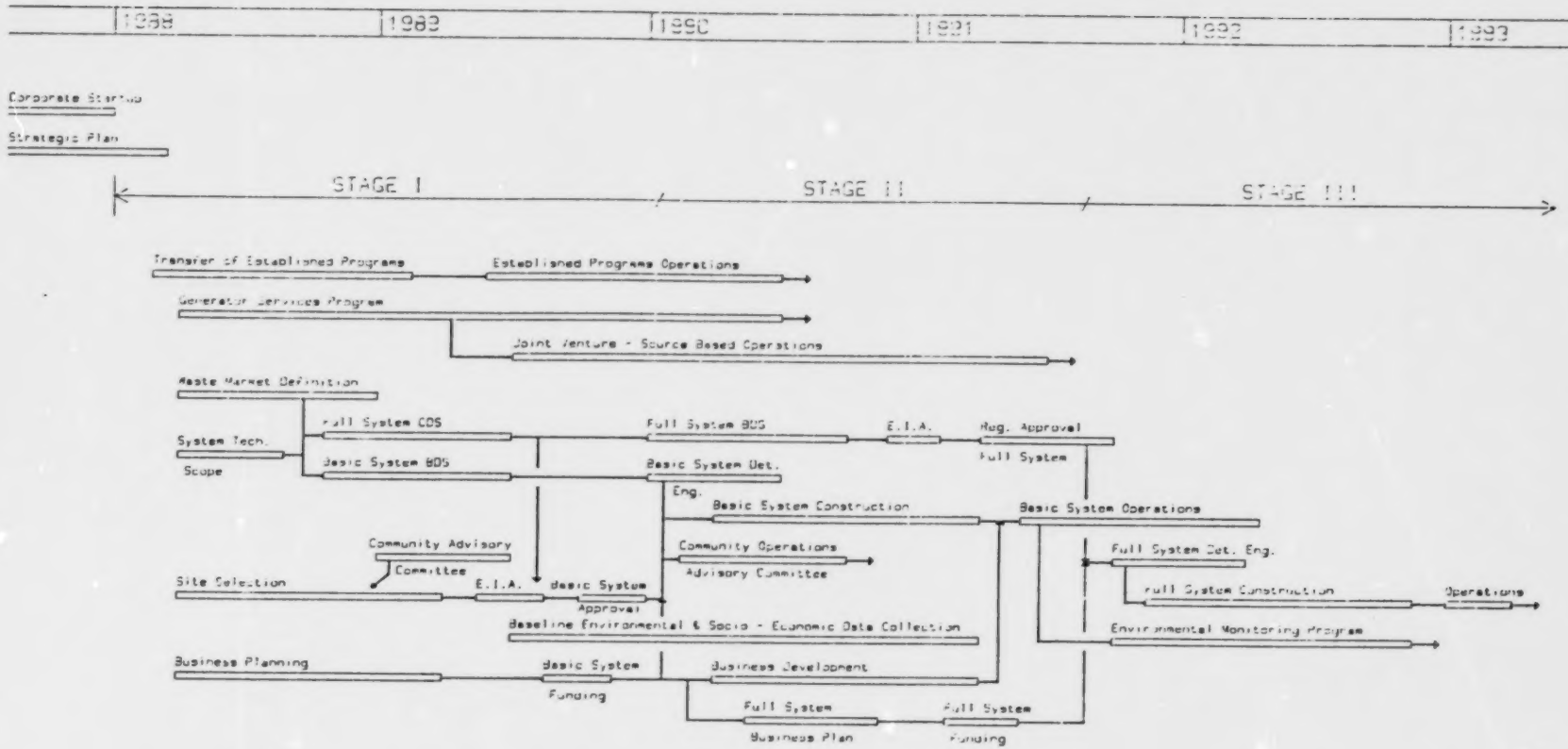
A basic feature of this approach is the provision for two formal review and approval processes at the end of each of the first and second stages as prerequisites to proceeding. One such review will involve the formal regulatory consideration of the Corporation's proposals for facility development including the necessary environmental impact assessment. The second will involve consideration of the Corporation's business plans and the funding requirements for the next stage. The process is essentially the same as undertaken for any capital development project where a relatively small expenditure is committed to pursue its feasibility (Stage 1) and the shareholders then review the results and decide on whether to pursue the actual development prior to having to commit significant capital resources. In this case the commitment will be staged in order to ensure an accurate judgement on the magnitude of and returns flowing from the investment.

4.4 STAGE 1 ACTIVITIES

With the approval in December 1987 of the Corporation's strategic plan and the supporting Stage 1 budget by its Board of Directors, the Public Investment Corporation and the Minister responsible for the Corporation, the feasibility stage of the system development was initiated. This work is divided into five major activity areas for purposes of responsibility assignment, scheduling and financial control. In the following, these activities are described and their status is summarized. Figure 2 provides a schedule for Stage 1.

MHWMC - SUMMARY SCHEDULE

Figure 1

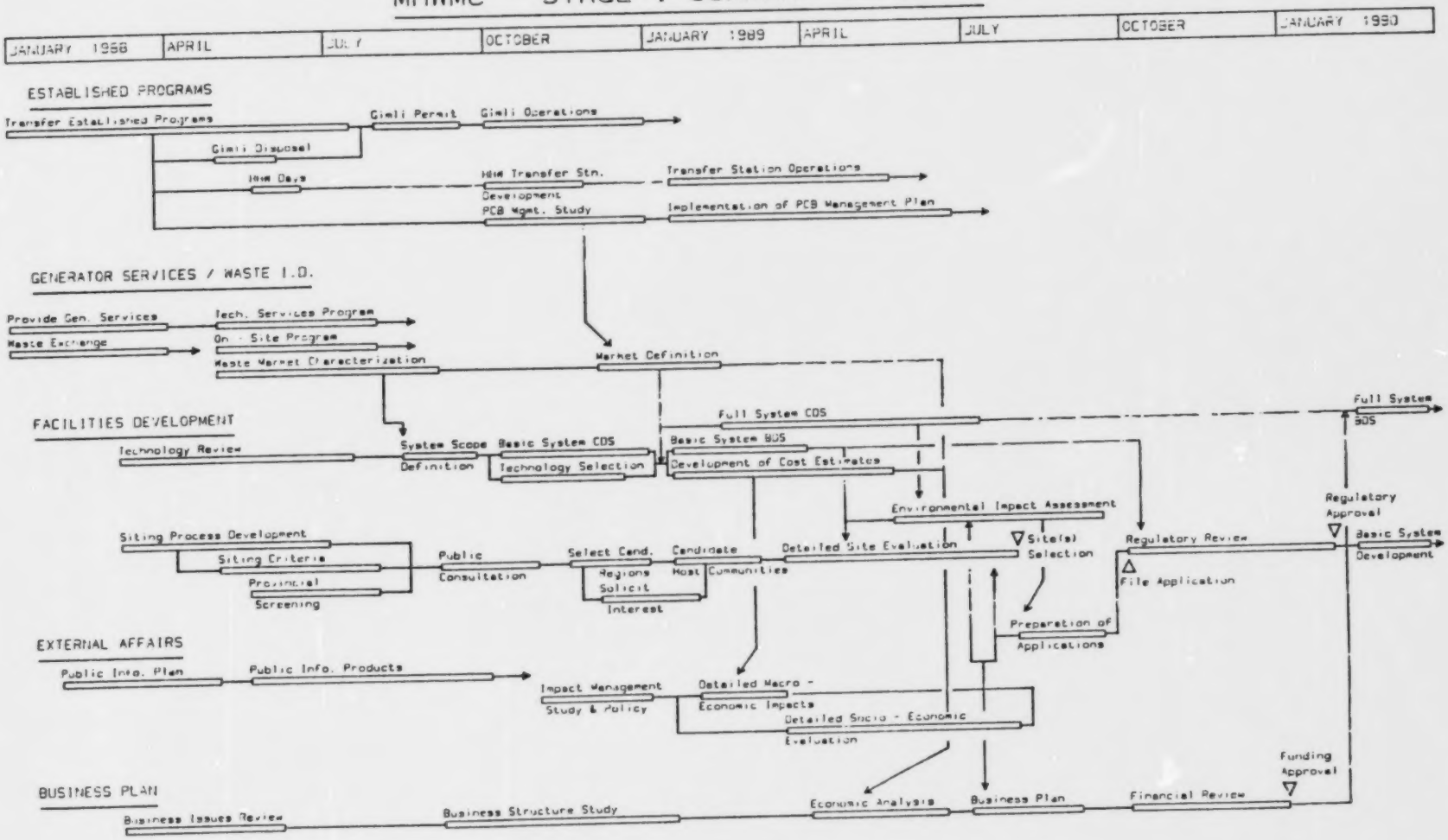


LEGEND: CDS - Conceptual Design Specification
BDS - Basic Design Specification
EIA - Environmental Impact Assessment

JULY 18, 1988
REVISION #1

Figure 2

MHWMC - STAGE I SUMMARY SCHEDULE



LEGEND: CDS - Conceptual Design Specification
BDS - Basic Design Specification

SEPT. 6, 1988
REVISION #2

a) Established Programs

The Corporation is undertaking responsibility for a number of programs previously administered by the Department of Environment, Workplace Safety and Health. The rationale for this transfer was the incompatibility and potential conflict of interest involved in the delivery of hazardous waste management services by a regulatory authority. These programs provide a useful and necessary public service in the absence of an overall hazardous waste management system, both as vehicles to maintain public awareness of the issue and to provide an outlet for wastes that would not otherwise have competent custody.

However, in agreeing to assume these responsibilities, the Corporation has been mindful of its mandate to work toward optimizing the cost recovery of its operations. For this reason the programs being undertaken by the Corporation have been limited to those which are supportive of and which can be integrated into the overall system being developed by the Corporation. The specific activities involved are the operation of the Gimli storage facility, participation in the provincial household hazardous waste collection initiative, administration of PCB storage with Manitoba Hydro and participation in the development of a long term pesticide residue management program to serve the province's rural municipalities.

The operation of the useful portion of the Gimli facility will be assumed in mid-1988. The facility provides for the temporary storage of chemical wastes and pesticide residues that are collected by the Department in the course of regulatory work and those that come into the Corporation's custody from other sources. The Corporation will bulk these and arrange for their disposal with commercial operators on a regular basis. The facility is being upgraded and application for a permit covering its operation as a temporary storage and transfer facility has been made. It is expected that its operation will be limited to 3 to 4 years, by which time the Corporation will have permanent facilities.

The Corporation is participating, along with the Department, the City of Winnipeg and Environment Canada, in an annual drop off collection of household hazardous wastes in Winnipeg (36). This involves funding and arranging for the disposal of these materials. In addition, the Corporation is pursuing the development of a year round drop off capability for household hazardous wastes.

Manitoba Hydro currently provides access to its PCB storage and oil treatment facilities for contaminated materials that cannot be competently managed at source. The Corporation will undertake arranging for this access on a cost recoverable basis. In addition, the Corporation is pursuing a jointly funded project with Manitoba Hydro to develop a long term management plan for the disposal of PCB contaminated materials currently being stored.

The Corporation is investigating the integration of an effective system for pesticide residue collection and disposal with its overall system development work. This will focus on its inclusion in the design of regional transfer stations as well as compatibility with potential regulatory action contemplated by the Department to control the product at its points of distribution and application. This work will be undertaken with the participation of the appropriate regulatory officials.

b) Waste Identification and Reduction

This activity area encompasses the overall characterization of the provincial hazardous waste market in quantitative and technical terms, along with the initiatives the Corporation is undertaking to promote source based waste management. Five specific activities are being pursued; waste exchange, industry group studies, the generator support services program, analytical capability development and waste characterization.

The Corporation currently funds an independent organization to administer the Manitoba Waste Exchange which provides an information service on waste materials that may be of value to others. This service is being integrated with the Corporation's generator service and waste characterization work to provide a more proactive vehicle for waste reduction.

Several industrial and institutional groups producing specialized waste streams have been identified as candidates for some form of collective volume reduction, treatment and disposal capability. The Corporation has undertaken a facilitation role through provision of technical assistance to these groups, participating in technical feasibility studies and assisting in obtaining regulatory approvals. In addition, the potential to participate in the development of specialized facilities on a joint venture basis is being pursued where an economically viable and potentially profitable opportunity is identified.

The Corporation has developed a capability to provide technical assistance to waste generators respecting waste management at source. This capability includes the identification of commercially available analytical and disposal capability, advice on available waste reduction and recycling technology and waste audit services. The service is offered at no charge where it serves to assist in longer term market development. However, it is not intended to compete with commercially available consulting services where these are available. Associated with this activity is the evaluation of the Corporation's own long term analytical requirements. Options being investigated include the utilization of existing government facilities, developing commercial capability on a joint venture basis or contracting work to existing facilities.

A major activity in this area is the characterization of the provincial waste market. With the original data developed during Phase I as a base line (4), the Corporation has initiated a comprehensive study this market. Using both internally generated data from the above activities and an external study, the quantities, type, distribution and availability of waste are being estimated. This work, which is scheduled for completion in late 1988, will provide input into the business planning and facility development activities described below.

c) Facility Development

This general activity area encompasses the definition of the technical scope of the facilities that the Corporation may develop, including the identification of technologies, the conceptual design of the facilities and associated infrastructure and the development of capital and operating cost estimates. In addition, it involves the site selection work and the environmental assessment studies required to support it.

The engineering work required to define the technical scope of the system will be undertaken in four parts. The first part, which is currently under way and scheduled for completion in the summer of 1988, involves the critical review of the Corporation's development approach from a technical perspective, a review of appropriate technologies and production of preliminary facility option descriptions. This will be followed by more detailed technology evaluation and selection studies. The basic design of the initial facility increment will then be undertaken to a level of detail needed to accurately define the Stage 2 capital cost estimates and complete the detailed environmental assessment. In parallel with this work, the conceptual design basis for the full system will be developed sufficiently to complete a preliminary site specific environmental assessment and provide longer term cost planning information.

The facilities siting component of this activity involves the systematic process of establishing siting criteria, applying these to the province on a progressively smaller scale and ultimately identifying several technically acceptable sites. Detailed evaluation of these will then be undertaken in terms of environmental impacts as well as economic and engineering factors. The result will be the selection of one or more technically and environmentally acceptable sites. Currently, the formal process for this work has been documented (37) for consultative discussion with various external groups. The development of site selection criteria is underway along with their application to provincial level constraint mapping studies. Completion of this work will lead to a major public information and consultation initiative specifically directed toward site selection, scheduled for the fall of 1988. It should be noted that it is the Corporation's intent to locate a site capable of hosting a fully integrated facility, even though the initial development will not necessarily involve the complete spectrum of treatment and disposal technologies.

d) Business Plan Development

This activity is directed toward the assessment of the various business structure options available for developing and operating the system in subsequent stages, defining the financial and market potential of them and doing the detailed economic analysis necessary to select a specific option. All of this information will be brought together into a formal business plan to be presented for review as part of obtaining financial support for continuing the undertaking into subsequent stages.

At the present time, the various options are being identified at a conceptual level in preparation for an externally commissioned study to evaluate them in detail. In parallel with this work the potential scope of the undertaking is being evaluated through preliminary investigation of the concept of a regionally based system servicing markets in adjacent jurisdictions. Both the conceptual business structure options and the development of a regional system are discussed more fully in the following section.

e) External Affairs Management

Inherent in an undertaking of this nature is the need to gain a high level of understanding and acceptance with a wide range of external stakeholders. This activity is directed toward achieving this through the development of an effective public information and consultation program, providing socio-economic impact assessment data in support of the siting activity and documenting the benefits and costs of the development proposals in social terms. This activity culminates in the formal public and regulatory review required at the end of Stage 1.

It should be noted here that the Corporation's approach in this area is directed toward development of a "co-management" model where major stakeholders have an active and meaningful role in the Corporation's decisions. In particular, this is intended to be locally oriented where the costs and risks associated with the development are traditionally perceived to be the greatest.

Current work is focused on implementing an effective public information program covering the Corporation's current activities. A number of information products have been produced, ranging from service and issue oriented brochures to technical reports. In addition, a resource centre is being established to provide various stakeholders and the public with access to current technical information on the subject. Presentations to a wide range of stakeholder groups such as industrial associations, technical societies, public interest groups, and municipalities are being given on a regular basis. Work has also begun on the social considerations related to facility siting including studies on compensation policies and cost/benefit analysis.

5.0 DISCUSSION OF POLICY ISSUES

5.1 Introduction

The development of a hazardous waste management system raises a number of public policy issues that require consideration and direction at appropriate points in the development process. While a number of these issues have been noted above, the following discusses the key ones in more detail, with particular reference to the Corporation's approach to them.

For convenience, the issues discussed are grouped under five headings:

a) Public Acceptance

b) System Need

c) Economic Viability

d) Business Structure

e) Market Scope

However, it is recognized that a high degree of interrelation exists among these issues in terms of their economic, public interest and political implications.

5.2 Public Acceptance

The first issue to be addressed relates to the acceptance and support required of the public for the development of a hazardous waste management system. The maintenance of public policy commitment to the undertaking is quite naturally closely tied to this issue. Regardless of the system's necessity, economic viability, business structure or service base, the history of such developments shows that public acceptance most often determines their success or failure (7,42).

At the outset of the system's development process, a high level of public support can be expected, provided the need for the development is accepted in principle. This has been well demonstrated through the course of the program's first phase in Manitoba and is reflected in experience elsewhere. As the development progresses, general support can be expected to continue and perhaps grow as awareness of the problem increases. The support of specific groups benefitting from the proposed services, such as industries, municipalities and institutions, will also be evident, particularly if the impact of regulation and use of more expensive options is being felt.

Similarly, advocacy groups such as environmentalists and labour organizations will be generally supportive, albeit with qualifications related to how the system is designed and the process by which it is pursued. However in the case of the more principle oriented environmental advocacy interests, concerns may be expressed about the undertaking's priorities that could outweigh the support in principle. This typically relates to the emphasis placed on source based prevention of waste relative to the development of treatment and disposal facilities. The argument

presented will likely suggest that the provision of such facilities promotes the continuation of the problem by making it practical for the waste generator to continue current practices as opposed to eliminating the problem at source through more fundamental changes in attitude and processes (47).

All of this general support is at least implicitly qualified by the assumption that the actual development will not affect the individual or particular interest group except to remove or distance them from a perceived risk to their quality of life, or be of economic benefit to them. At the point in time where the development starts to become focused in terms of actual facilities and where they will potentially be located, the nature and degree of support can be expected to change.

While a large majority of the public will continue to be supportive, those directly affected by the development may become unsure of its merits. When specific locations are selected, support may change to direct and often hostile opposition. The NIMBY (not in my backyard) effect comes into play where the common good is perceived as being achieved at the expense of a small minority of individuals. In the case of a hazardous waste development, this is accentuated by the perception that environmental and health risks are being transferred and concentrated. Since candidate facility sites are commonly selected in less populated rural areas, the perception exists of this risk transfer occurring from the more wealthy and politically powerful urban areas to the poorer rural area. These local interests often become allied with environmental groups adopting the principle that the solution lies at the source, rather than transferring the problem to others.

Countering the potential opposition from those immediately affected by the facilities' site at a local level may be the aggressive pursuit of the development by local business interests in communities near to a proposed site. Facility developments do offer significant benefits to such communities in terms of quantity and quality of employment, economic stimulus, additional infrastructure and tax revenue. For this reason, it is not uncommon for communities with a poor or endangered economic base to volunteer and lobby for such facilities even though they may not be suitable from an economic or environmental perspective.

In other jurisdictions, the existence of strong local opposition has usually led to the development process being stalled due to the hesitancy of regulators and elected officials to sanction the development proposal. This type of situation developed in British Columbia during the province's first attempt to locate a site. It currently exists in Ontario with respect to the West Lincoln site proposed by OWMC. In both these cases, well organized opposition groups developed to consolidate local opposition (43,44). Experience in the U.S. is even more discouraging. Only six successful sitings have been achieved to date since 1980 out of eighty-one proposals (45). The only well documented unopposed siting was that of the Alberta facility where heavy emphasis was placed on finding a volunteer community. In this case, the actual site has no immediate neighbors, thus avoiding a traditional source of opposition.

Given this history, the Corporation can anticipate that it must plan its developments in a manner that meets the following potentially conflicting requirements:

a) The site(s) of facilities proposed must meet high and defensible standards respecting environmental and health risks in that it provides effective secondary protection to potential impacts.

b) Such site location(s) should not compromise the economic viability of the system either due to distance from market or the need to provide prohibitively costly extra protection in the facilities design to compensate for deficiencies in the above requirement.

c) The site locations have to be at least accepted and at best desired by their immediate neighbors and the surrounding communities.

d) The overall activities and priorities adopted will maintain sustained public and political acceptance of the principle that such facilities are required as part of the problem's long term solution.

The approach being pursued by the Corporation in addressing the need for public acceptance is based on integrating a high level of public involvement into a systematic siting process (37). The objective is to maintain a high level of technical integrity respecting environmental protection and economic practicality, with the equally important priority of gaining local acceptance and support. At the same time the development of facilities should be kept in context as only a part of the development of an overall hazardous waste management system which maintains a bias toward source based management.

At the present time no decisions on site selection have been made. The first step in this process which is currently underway is to plan and fully explain the process itself. Associated with this is the development and application of the general technical siting criteria to locate specific regions in the province having a high probability of containing technically suitable sites. This in effect sets an environmental and engineering standard on which the site selection process can proceed to deal with the acceptance issues. All of this work will be publicly available and discussed with a view to obtaining public input and consensus, prior to acting on it. In addition, an open invitation to communities would exist to express interest in having their area considered.

At this point, the geographically defined areas, identified as offering a high probability of having acceptable candidate sites as judged by environmental, land use and technical criteria, will be matched with expressions of community interest. If necessary, solicitation of additional interest would be undertaken on a selective basis. More detailed evaluation work would then be initiated in these areas on a joint basis with the communities involved with the objective of locating specific sites. The most promising of these sites would be subject to detailed environmental and socio-economic impact assessment. Recommended site(s) would then be proposed as part of the necessary regulatory applications. A major consideration at the point of the actual selection will be the degree of expressed community support and acceptance. Figures 3 through 6 illustrate this process schematically.

It is recognized that the process cannot proceed in isolation. A large amount of consultation with government organizations at the provincial and local level will be required. A significant risk to the efficiency and success of the process is the need to accommodate the interests of such agencies in order to avoid conflict and institutional opposition. In this regard, success will depend on the sensitivity shown by the Corporation in involving these agencies and on the discipline of the bureaucracy in responding to the issue.

Similarly, the interests of a wide range of elected officials, at both the local and provincial level, are impacted by the development generally and the siting question in particular. In this regard it will be important that the nature of the undertaking be well understood by all those potentially affected in order that they can make informed judgements on the merits of a proponent's proposal.

At the provincial level, this will require the effective and anticipatory provision of information on plans, progress and issues by the Corporation to the responsible Minister. Conversely, policy direction related to specific sensitivities and issues needs to be received and responded to in the process. At the local level a policy of equal treatment and evaluation of community interests on their merits and the ultimate right of the community itself to decide is proposed.

The continuation of the Corporation's present policy of dealing openly with all local officials is applicable throughout, as is the utilization of the associations representing municipalities for communication. Consideration will also be given to the inclusion of direct participation in the proponent organization through its Board of Directors by municipalities. This would include both urban centres that represent major users of the system and, at some point, the communities where sites are located.

5.3 System Need

On an international and national level, the question of need for the effective management of hazardous waste is well established. There is widespread recognition throughout North America, Europe, the Far East and to some degree in the third world that a capability to properly manage these wastes is required. However, the need for a specific local capability in Manitoba may be questioned by some, both in the context that it may not be required now and the magnitude of resources to be directed toward the problem. The province does not suffer from the highly visible impacts of traditional waste management practices and, in relative terms, generates a small volume of hazardous waste. This raises the questions of its priority as a publicly sponsored initiative and of simply continuing to utilize the alternative of exporting wastes elsewhere.

In response to the question of acting now, as opposed to waiting until either the need is more visible or resources are more plentiful, a number of points can be made:

a) Despite the relatively low levels of waste generation, the impacts are being felt in Manitoba as a result of traditional practices. A measurable decline in environmental quality has occurred as a result of increasing contamination of both surface and ground water. The decline will continue with time if traditional practices are maintained.

b) Based on the experience of comparable jurisdictions, it can be anticipated that site specific disposal problems, as manifest by controversial environmental or health impacts will arise in Manitoba. Public disclosure and associated media coverage has occurred regarding such sites in other provinces. The impact of such revelations tends to heighten public sensitivity to the issue, force reactive as opposed to planned solutions, politicize the issue and ultimately make the solutions more difficult to implement.

FIGURE 3
PROPOSED SITE SELECTION PROCESS

PHASE 1
Site Selection Process and Criteria Development

KEY STEPS
- o Background Information Collection and Government Agency Input
- o Prepare Site Selection Process Document
- o Prepare Proposed Site Selection Criteria
- o Provincial Screening to Identify Candidate Regions
- o Selection of Candidate Regions
- o Public and Stakeholder Review of Process

PHASE 2
Selection of Candidate Host Communities

KEY STEPS
- o Data Collection on Candidate Regions
- o Technical Screening of Regions
- o Community Consultation in Candidate Regions
- o Define and Evaluate Potential Candidate Host Communities
- o Select Candidate Host Communities

PHASE 3
Site Selection and Evaluation

KEY STEPS
- o Establish Community Advisory Committee(s)
- o Finalize Siting Criteria and Identify Mitigation Issues with Committees
- o Identify Candidate Sites
- o Detailed Evaluation of Candidate Sites
- o Confirmation of Community Support
- o Site Ranking and Identification of Preferred Development Alternatives
- o Preparation of Regulatory Proposal

FIGURE 4
PHASE 1: SITE SELECTION PROCESS AND CRITERIA DEVELOPMENT

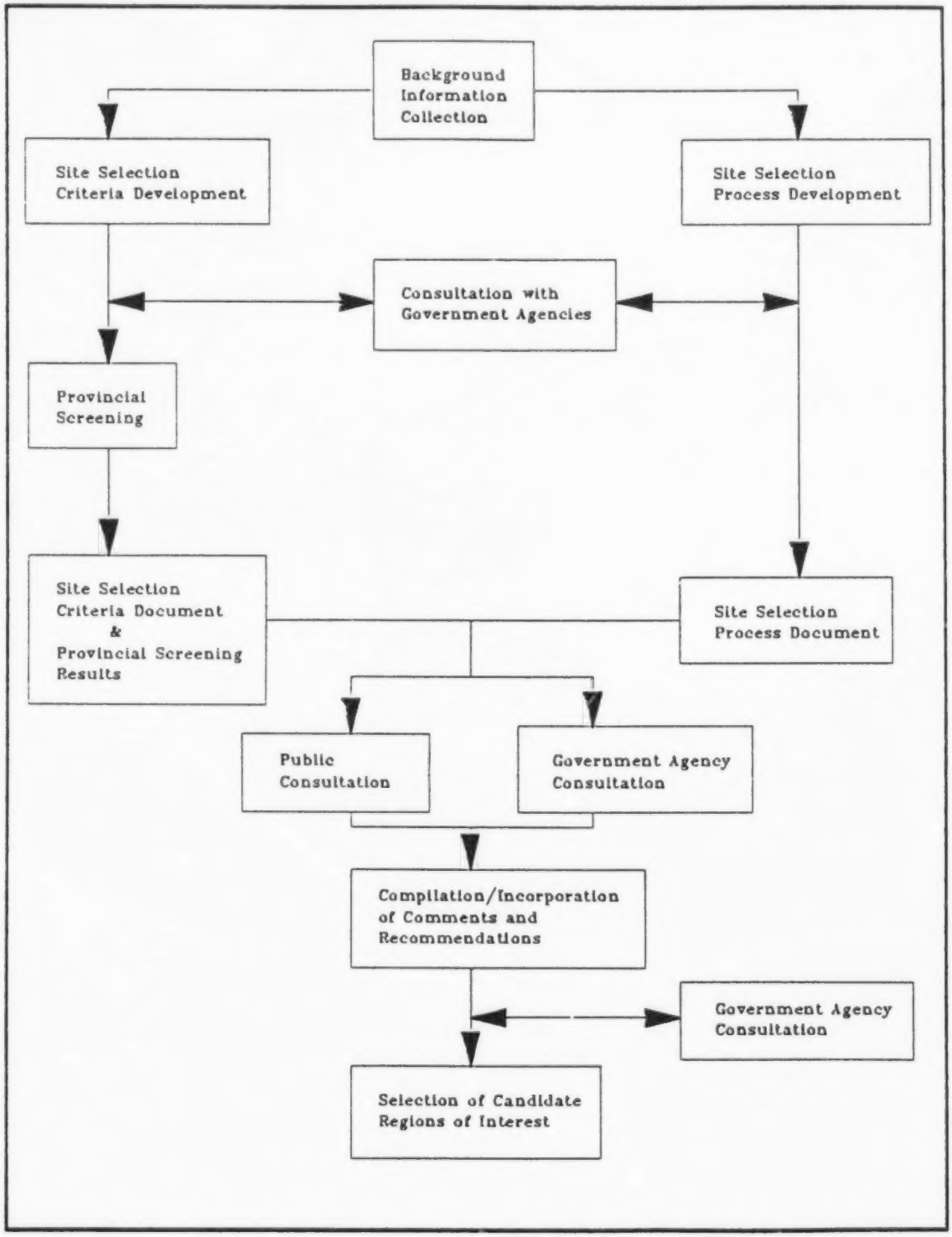

Background Information Collection
Site Selection Criteria Development
Site Selection Process Development
Consultation with Government Agencies
Provincial Screening
Site Selection Criteria Document & Provincial Screening Results
Site Selection Process Document
Public Consultation
Government Agency Consultation
Compilation/Incorporation of Comments and Recommendations
Government Agency Consultation
Selection of Candidate Regions of Interest

FIGURE 5
PHASE 2: SELECTION OF CANDIDATE HOST COMMUNITIES

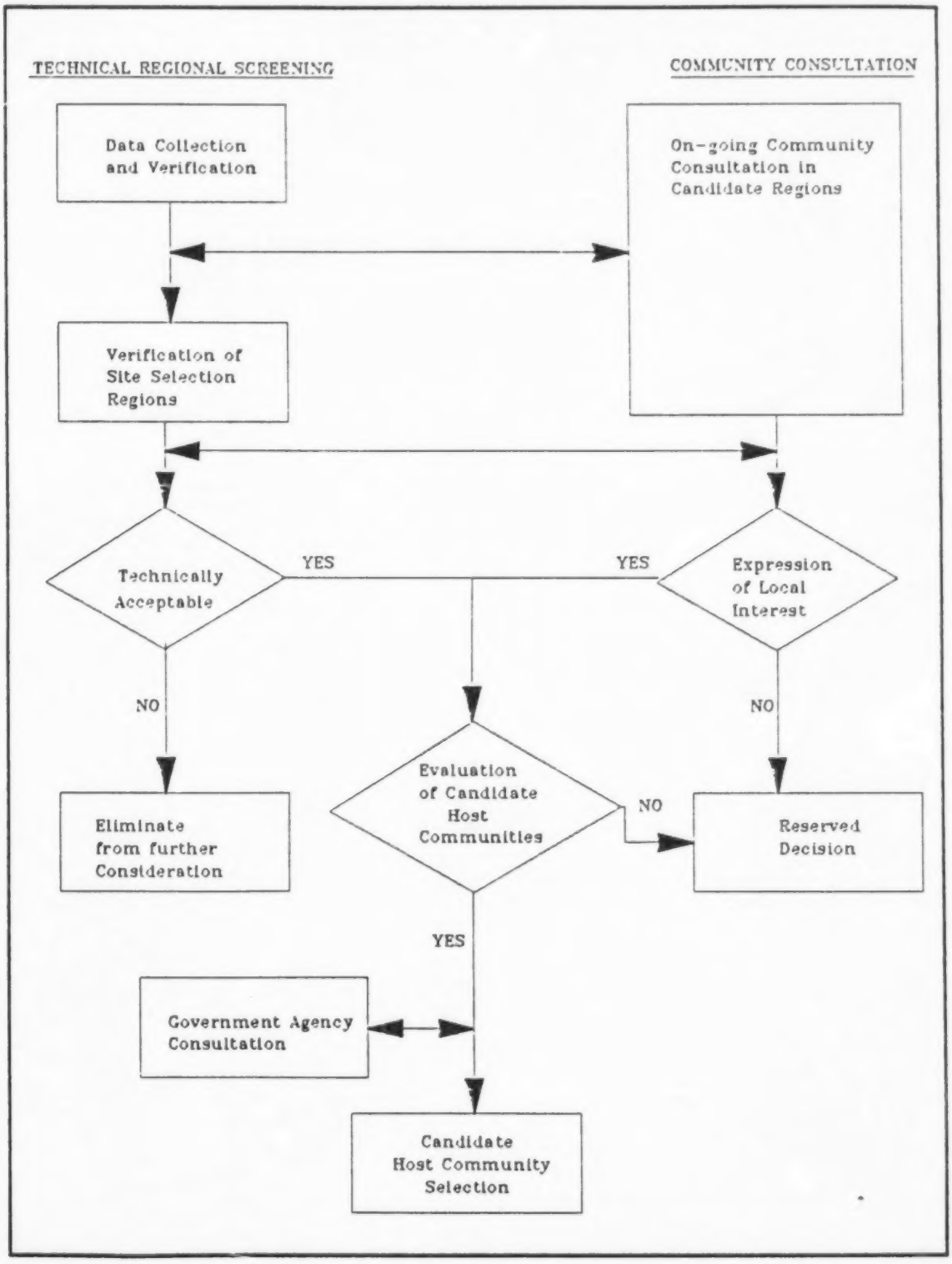
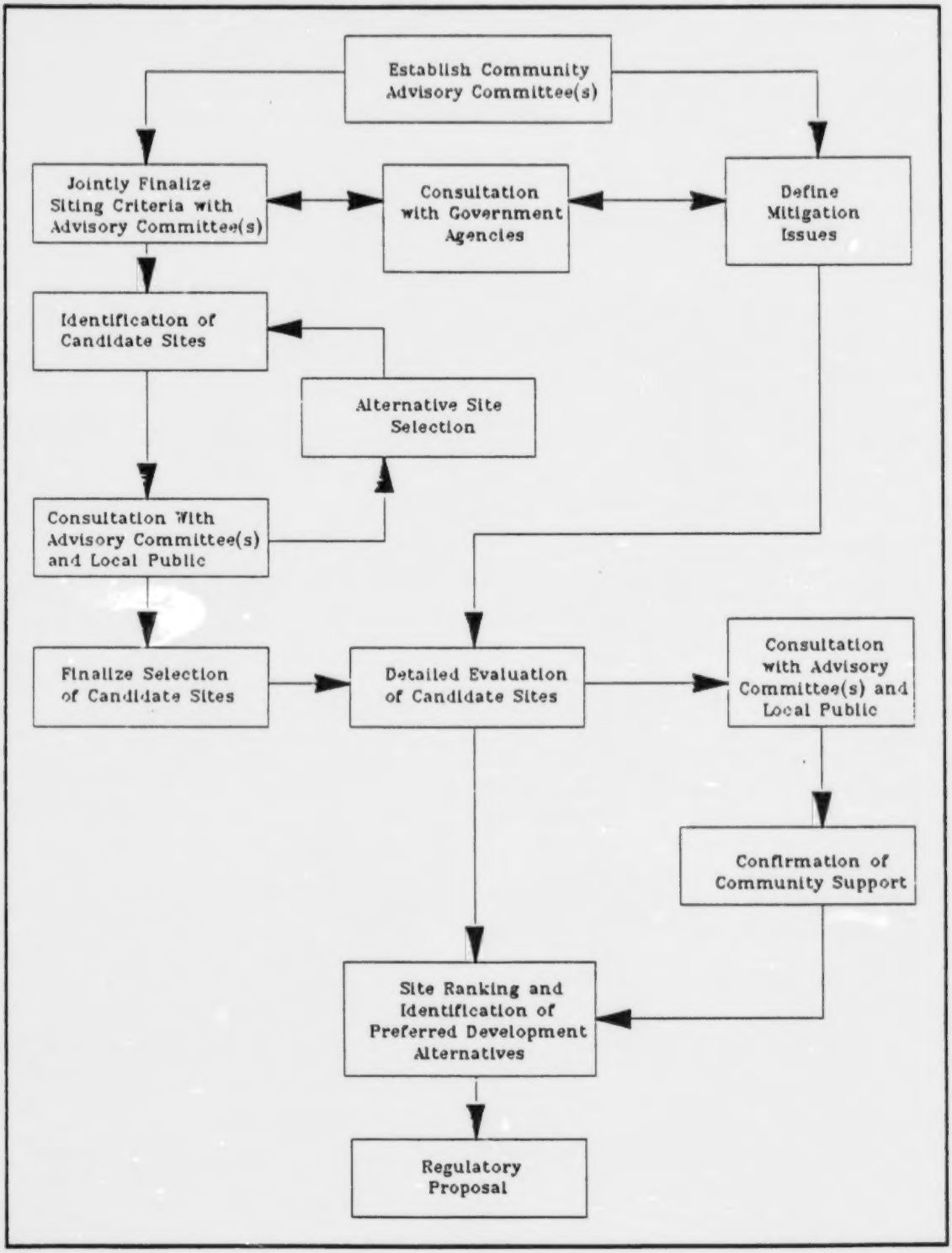


FIGURE 6
PHASE 3: SITE SELECTION AND EVALUATION


Establish Community Advisory Committee(s)
Jointly Finalize Siting Criteria with Advisory Committee(s)
Consultation with Government Agencies
Define Mitigation Issues
Identification of Candidate Sites
Alternative Site Selection
Consultation With Advisory Committee(s) and Local Public
Finalize Selection of Candidate Sites
Detailed Evaluation of Candidate Sites
Consultation with Advisory Committee(s) and Local Public
Confirmation of Community Support
Site Ranking and Identification of Preferred Development Alternatives
Regulatory Proposal

c) The costs, in both financial and social terms of dealing with hazardous waste increase as the problem builds cumulatively. Conversely, prevention by managing the wastes, as they are produced, is much more cost effective than remediation of a contaminated area or environmental resource such as a water source. The high remediation costs currently faced by others are evidence of this.

d) A high level of public awareness of the hazardous waste issue exists in Manitoba and has produced the resultant expectation that a system will be provided. In this regard general public criticism of the process to date has focused on action not being taken soon enough rather than it being needed or being pursued too quickly.

With respect to the option of utilizing capability elsewhere rather than developing it within the province, several points should be noted:

a) While out of province treatment and disposal capability can be used, incremental collection, storage, transport and pretreatment infrastructure will be required to enable the capture of a meaningful volume of wastes. Therefore, an investment in the components of the system at and close to the source, including source based waste management and regulatory compliance capability, will be required in any event.

b) Out of province capacity in Canada is limited, with the resulting physical limitation on how much of Manitoba's waste could be exported. Similarly, currently available facilities cannot handle all types of waste.

c) As a result of capacity limitations in the available Canadian commercial facilities, little competition exists and the responsible waste generators in the province would continue to pay high and unpredictable prices for these services. Not being located in a jurisdiction that offers this service on a cost effective basis is an associated competitive penalty carried by the province's industry.

d) Access to the broader range of U.S. facilities for most types of wastes is available (PCB's being the major exception). However, this is expensive, often carries a surcharge imposed by the importing state and, perhaps most importantly, leaves the ultimate liability for disposal with the exporter. In effect, the originator of the waste will be liable in perpetuity for remediation costs associated with the waste under U.S. legislation.

e) Access to out of province facilities in either the U.S. or Canada is not guaranteed and is subject to periodic changes in the public policies of other jurisdictions. Typically, jurisdictions with a treatment and disposal capability have tended to restrict imports for public policy reasons except where reciprocal capability is offered to balance the perception of being someone else's dumping ground.

f) Associated with the above point is the view that each jurisdiction has a moral obligation to at least contribute to the management of the environmental problems that it creates and cannot realistically expect to export these problems to others.

h) The development of capability elsewhere represents a meaningful lost economic development opportunity in the environmental services industry, an area currently targeted for growth in Manitoba

In summary, a current need for the development of a system in the province does exist and the option of remaining permanently dependent on the resources of other jurisdictions has significant risks related to security of access, cost and liability. Having said this, the process of developing the provincial system needs to be flexible enough to balance these factors against the near term utilization of competitive and accessible capability elsewhere where this offers economic advantage. This is a major reason for the Corporation's approach of incremental development, such that the viability of out of province options can be tested and the local market can be accurately predicted.

5.4 Economic Viability

A major factor in the development of a hazardous waste management system is the nature of the investment required and its economic viability. In the following, this question is discussed in general terms, independent of the associated issues of system ownership and how the undertaking should be managed in business terms. These issues are discussed in the next section under the heading "Business Structure".

The issue of investment characteristics and economic viability involves the questions of:

a) How much will the system cost?

b) Where will the money come from?

c) If and how will the investment be recovered?

The overall investment is composed of several types of costs as defined below;

a) Development Costs - This is the money required to plan the system and manage its development. Within this category, it is useful to differentiate between precommitment and post commitment costs as follows:

i) Feasibility Costs - These relate to the initial risk investment to undertake the study work to determine the system's feasibility, prior to making major financial commitments. It involves defining the technical scope of system components, doing the environmental and business assessments, selection of sites, public acceptance and participation costs and obtaining the required approvals. It also includes the organizational costs required to manage this work. In the case of Manitoba, the feasibility costs are those currently being incurred by the Corporation in Stage 1 of the system's development cycle.

ii) Project Management Costs - These relate to the technical development and management costs to put the actual system components in place once a commitment is made to them.

b) Facility Costs - This is the money required for the design and construction of the system's physical assets and supporting infrastructure. These can be of two types:

i) Direct Capital Costs - These relate to the cost of facilities directly used by the system to collect, store, handle, analyze, treat and dispose of the waste, inclusive of detailed engineering, equipment and construction costs.

ii) Indirect Capital Costs - These relate to the costs of any incremental infrastructure required to support the above facilities such as roads or utilities. In some cases these costs can extend to land acquisition and site specific infrastructure. They would also include any community oriented compensation required in the facility siting process.

c) Operating Costs - These are the normal costs associated with operating the system and its facilities in order to provide the required service. They include such things as labour, materials, maintenance, consumables, utilities, services and overhead. As will be discussed below, these costs can be further classified into two subcategories; those incurred by managing wastes for a fee on a cost recoverable basis and those incurred for wastes managed as a public service.

This overall cost category breakdown is essentially the same as one would expect from any development project where the sum of the development and facilities costs are capitalized as an investment on which a return is anticipated through operating revenues. In this context, it excludes any cost incurred publicly to regulate either the waste generator or system operator. For simplicity it also excludes financing costs since these will vary with the source of financing. However, any full accounting of costs and their recovery should provide for these charges.

While structurally the same in terms of its components, the nature of the investment differs from a more conventional investment project in several ways. Typically the development costs are higher due to the extensive public and regulatory involvement inherent in this type of project. This comes directly from the somewhat unique emphasis on public involvement and indirectly from the longer development period typically required. Similarly, the direct facilities costs tend to be inflated due to the comprehensive environmental and health protection measures built into the facilities. In addition, several differences from conventional capital projects exist related to who typically makes the investment, the potential for cost recovery and how this recovery is obtained. These points are discussed in greater detail below.

At this point, the overall costs of the Manitoba system cannot be accurately determined except for the feasibility costs. In effect, the province through the Corporation has elected to invest a small amount of risk capital ($4.5 Million) to make this determination. The source of this initial funding is publicly borrowed money. In addition, provision has been made for up to $35 Million in Loan Act funding of development and direct facilities costs in the event the province elects or is forced by default to continue as the primary investor.

In relation to the experience of others who are undertaking or have undertaken the development of similarly comprehensive systems, this level of investment is quite modest. Typically the development costs to get to the point of determining feasibility and making a commitment to proceed with facilities have been between $10 Million (Alberta) and $60 Million (Ontario) with the actual facilities costs ranging from $50 Million to $250 Million respectively.

Turning to the second question identified above, the sourcing of funds for the development of the system is somewhat more complicated than that of a conventional development project. In general terms, two generic sources of such funds are available; private investors and public sources. Table 4 illustrates the experience of other Canadian system developers in this regard along with the approximate or estimated magnitude of the investment by cost category.

From this it is evident that a significant role has been played by public funding in all categories. The feasibility costs and the indirect facilities costs have almost exclusively been funded publicly and a substantial participation in the direct facilities costs has been required in Alberta (40%) and Ontario (100%). It should also be noted there is a tendency to transfer capital costs, normally viewed as direct facilities costs (i.e site services, land, decommissioning and environmental monitoring) to the publicly financed indirect facilities cost category, where private investors are participating in the direct facility funding. Similarly, public financial resources have been required to backstop private acquisition of capital, provide a guaranteed return to private investors, directly subsidize operating costs for certain waste streams and underwrite the insurance and remediation liabilities associated with the investment. In summary, a hazardous waste management system is not an undertaking that readily attracts private risk capital in a conventional sense.

Following from the above discussion of how the development may be funded is the question of cost recovery of the investment. Preliminary analysis by the Department of Environment and Workplace Safety and Health during Phase I indicated that all the capital costs (i.e development and facility costs) would have to be forgiven or converted to crown equity. In addition, an ongoing operating subsidy was tentatively proposed to keep user fees affordable (4,32). Ontario's preliminary business planning is assuming a combination of capital forgiveness and equity conversion with user fees tailored to operating costs (38). Alberta, with the only operating system in Canada, had originally assumed that both capital and operating costs would be recovered. To date, only the privately invested portion of the direct capital investment is being recovered with this recovery being publicly subsidized along with the operating costs. The B.C. model, while only at the early stages of development, contemplates recovery of all capital and operating costs, except for the yet to be defined infrastructure costs to be publicly funded. The private proponent has limited its investment to removable assets and requires market guarantees to sustain its participation (23).

TABLE 4

SUMMARY OF FUNDING SOURCES AND ESTIMATED COSTS FOR CANADIAN HAZARDOUS WASTE MANAGEMENT SYSTEMS

	Alberta	Ontario	British Columbia	Manitoba
DEVELOPMENT COSTS				
a) Feasibility	Public	Public	Public	Public
b) Project Management	Private Public	Public	Private	?
FACILITIES COSTS				
a) Direct	Private Public	Public	Private	?
b) Indirect	Public	Public	Public	?
TOTAL CAPITAL INVESTMENT	Public (55%) Private (45%)	Public	Public (25%) Private (75%)	? ?
OPERATING COSTS	User/Public User		User	

The exceptions to the above trends are the two major private facility operators in Eastern Canada (Tricil and Stablex) who have established substantial capability without any public financial support. However, these facilities are not universal in the sense that they can or will handle all waste and are situated to service large, profitable markets on a selective basis. In addition, both established facilities prior to the present high level of public sensitivity to siting. This would likely entail more development uncertainty if undertaken today.

In summary, the experience of others indicates that public financial support of the system is likely required and that an element of social accounting will be required in the justification of this investment in terms of its potential returns. The reasons for this relate to one or more of the following factors that are relevant to the situation in Manitoba:

a) Economies of Scale - All provincial systems, with the exception of Ontario, offer small waste markets relative to the basic investment required to provide the wide range of facilities and infrastructure involved and the scale of technology applied.

b) Market Factors - The markets served contain a large number of small, widely distributed waste generators. These provincial systems are required to accept all waste presented to them and to do so on an equitable basis regardless of location or volume. On the other hand, profitable markets may not be available to them due to "high grading" by speciality operators. Similarly a significant revenue base related to source based waste management is usually closed to a system oriented toward a centralized disposal facility.

c) Affordability to Users - In a purely commercial situation the system will be paid for by its users, the waste generators, with rates set on the basis of cost recovery (i.e. capital and operating costs plus return on investment) with their viability being judged against the alternatives (i.e existing commercial services or source based waste management).

However, a number of other factors come into play, including the limitation that rates must be affordable to a user who until recently did not associate any significant cost to disposal of his waste. In this context they must be high enough to promote conservation but not high enough to discourage regulatory compliance (e.g. illegal dumping) or discourage economic activity. This is further complicated by the fact that these limiting rates are different for different types of generators. Large sophisticated users will recognize the service as a cost of doing business more readily than smaller users and will accommodate realistic rates. Some users that the system is obligated to serve may not accept any cost, or may be provided with the service without direct charge as a public policy (e.g. householders, farmers).

d) Regulatory Scope - As noted earlier, the existence and enforcement of regulation is critical to the viability of a system in that it provides a market and removes the cheaper alternative of traditional practice.

In short, it should be recognized at the outset that the system's economic viability cannot be judged by strictly conventional measures and that a form of public funding whose recovery cannot be guaranteed will be involved. Having said this, it is also necessary to plan the development in a manner that minimizes the magnitude of this funding, maximizes the opportunities for cost recovery from users within public policy constraints, and structures the supply of this funding in a manner that is sustainable.

The approach adopted by the Corporation is designed to accomplish the above within the overall constraint of providing an environmentally sound, universally accessible system in the following ways;

a) Incremental development should minimize and phase the capital requirements such that the investment is best tailored to the market.

b) The focus on small scale and transportable technologies should assist in balancing the limitations associated with economies of scale.

c) The mandate to participate in the system as a whole, inclusive of source based business opportunities, will allow access to a broader base of revenue earlier in the development process.

d) The consideration of regional , not just provincial markets, should enhance economies of scale as well as optimize economic access to capability in other jurisdictions. (Section 5.5)

Aspects that remain to be resolved in terms of structuring the undertaking as a business venture include the form and timing of the public funding required. In addition, the method of balancing system affordability and competitiveness with universality and equity of access needs analysis. Some initial thoughts for consideration in this regard include;

a) It is generally preferable to direct public financial support toward the development and direct facilities cost components rather than the subsidy of operating costs. This provides for the retention of equity assets and avoids an ongoing general revenue commitment that may be difficult to consistently or adequately sustain.

b) The potential for attracting private capital investment should be pursued on a system component by component basis, but the provision of investment guarantees, backstopping of financing or exemption from liability should be approached carefully, recognizing these are alternative methods of public funding and risk assumption.

c) Access of the overall system owner/operator to revenue generating opportunities in the source based or speciality waste management components of the system should be encouraged in order to optimize the system's overall revenue generation potential.

d) While the overall system owner/operator should not necessarily be allowed a monopoly, any competing facilities should be subject to the same regulatory and public policy constraints in developing and operating facilities.

e) In order to provide a true accounting of total system cost, direct facility costs should include all incremental infrastructure costs normally associated with such a development. Indirect costs should be limited to that infrastructure which is normally funded and owned by various levels of government and that would ordinarily be provided to service any industrial development project.

f) Equity of access with respect to location should be provided by applying equalized transportation rates among all fee paying generators.

g) The rates applicable to fee paying generators should be market determined, based on out of province rates, and not be used to subsidize those not paying market determined service fees as a matter of public policy.

h) The costs of providing service to those not paying competitive commercial rates should be paid by direct grant to the system owner/operator with the identification of eligibility being a matter of public policy.

5.5 Business Structure

The above discussion leads into consideration of the associated issue of who should ultimately own and operate the system's various components. At present, the assumption of a publicly owned and perhaps operated system has been made for initial planning purposes in the feasibility study stage of its development. However, apart from commissioning a public Corporation to undertake this feasibility stage, a wide range of options are available for evaluation in the course of this work. In the following, these are discussed in terms of advantages and disadvantages, recognizing that the selection of a specific business structure is one of the basic objectives of the feasibility work currently being undertaken.

In general terms, the business structure options for the system as a whole fall into three broad types; public ownership, private ownership and a joint venture.

a) Public Ownership

This option can be defined as any arrangement where the system is financed with public money, the equity in the principal system facilities is held publicly and the functional/fiscal responsibility for at least coordinating the various system component operation is directed by a government agency of some type, even though component operation may be contracted out. If it is to have a commercial orientation, a public corporation would be the probable vehicle. However, if a strictly administrative or oversight orientation was adopted, it could be a government Department, Board or Commission, provided no conflict of interest respecting regulatory powers was involved.

In terms of actual structure, the public ownership option encompasses a number of suboptions ranging from the full ownership and operating responsibility for the complete system (i.e. publicly owned utility), to contracting the operation of the various components to private firms or public agencies with specific technical expertise for a fee. The variations within this range relate to the degree of contracting undertaken. For example, the main treatment and disposal facilities might be operated by a public Corporation with collection contracted to private trucking firms and transfer stations operated by municipalities.

b) Private Ownership

This option would involve the financing of all capital costs excluding the feasibility and true indirect facilities costs from private sources, the equity in facilities being held privately and the facilities being privately operated. Public participation would be limited to funding initial feasibility work and support infrastructure and the regulation of the system's development and operation. The provision of services, required for public policy reasons or to maintain objectives related to universality and equity of service, would be by governments contracting for the service as a system user or through grants. Theoretically, variations within this option would potentially range from having a single private owner/operator with a monopoly (i.e. privately owned utility) to a number of private firms operating various system components independently on a competitive basis.

iii) Joint Venture or Ownership

This option encompasses the wide range of business structures where the financing, equity and operation of the system is shared between the public and private sector. This can be for the system as a whole or for specific components of it. The potential partners in the venture could be commercial waste managers, municipalities, waste generators, venture capital pools and public Corporations. The structure could extend from the development of generator cooperatives to privately financed/lease-back arrangements.

Having broadly defined the options, it is useful to generally examine the potential advantages and disadvantages of each , recognizing that it is premature to take any firm position until they are fully tested and evaluated.

From a business and commercial perspective, the purely private option has the most appeal in that it removes government from any proponent role in a difficult socio-political issue, minimizes public expenditure, allows market forces to work and would be perceived as being more efficient. If this was a conventional project development opportunity with a sound basis in economic viability and low potential to attract public concern, this option would undoubtedly prevail.

Unfortunately, the nature of the undertaking makes exercising the purely private option difficult. Otherwise, a privately owned and operated hazardous waste management system would likely already be in place. As was discussed in the preceding section, the initiation of hazardous waste management systems has typically fallen to the public sector by default since private investors recognize the substantial risk of proposing a controversial, highly regulated project without a

public policy commitment. The attempt by Genstar in B.C. and others in the U.S. have shown this risk. Once initiated and a firm public policy commitment to its pursuit has been established, private investment can be attracted provided governments are willing to lead the high risk development activities such as facility siting and, in some cases, backstop the financial and liability risks.

The purely private option also presents some disadvantages related to its acceptance by the public. However unfairly, the public tends to perceive the hazardous waste problem as being originally caused by the private sector who may maximize individual financial gain at the expense of long term public values. They tend to look to government for protection in such situations, both through the application of regulation and the provision of the means to protect them. In this context the private ownership of the vehicles by which protection is to be provided could raise concerns related to the accountability and competence of the system (39). This would make its development more difficult to sell in terms of public acceptance. It should also be noted that this perception would be heightened if direct or indirect public financial support was provided to a private system proponent without an element of management control and risk sharing.

Accepting that a purely private option is unlikely because the investment could not be attracted, and if it could, would be difficult to sell, the various options relating to a full or partial, publicly owned and operated system should be focused on. Intuitively, the use of joint ventures or ownership as a business structure has some appeal in that they retain some of the real or perceived advantages of a private system (i.e. investment, expertise, efficiency), while allowing the accommodation of public priorities relating to the system's overall scope, its coordination and public's acceptance of it. At this point, it is not possible to evaluate the wide range of variations within this option, except to note that it and the fall back option of a purely public system remain consistent with the approach currently being pursued by the Corporation.

In particular, the incremental approach to facility development combined with the emphasis on source based waste management initiatives provides the opportunity to test the feasibility of various joint venture and contracting arrangements on a small scale, before a larger financial or legal commitment is made. For example, developing privately operated transfer stations for such things as household hazardous waste or equity participation in recycling initiatives would represent such tests. At the same time, the Corporation is able to examine the overall system feasibility and scope in a manner consistent with the public policy requirements imposed on the system. With this knowledge base, the optimum distribution of public and private participation on a component by component basis can be decided upon.

5.6 Market Scope

The success or failure of commercial waste management enterprises in economic terms has been closely tied to their ability to service the largest possible market geographically and at the same time be selective in the wastes they are prepared to handle. In this section, these two issues are discussed specifically, although they were introduced in Section 5.3.

With respect to the geographical scope of the market to be served, it is evident that the economies of scale are improved with greater market access. This is particularly true in Western Canada where provincial markets are small and likely less than the minimum economic scale needed to apply traditional technologies. This is evidenced by the current experience of the one operating system in the region which lacks sufficient feedstock to carry its operating costs due, in part, to being prevented from importing waste from outside the province (19). Furthermore, this limitation was recognized in the first major conceptual study on the problem published in 1981 when a regional system for Western and Northern Canada was recommended for study (41).

In the context of developing a system in Manitoba, a similar policy issue remains at this point. A choice between developing a capability for the province only, or looking at a broader market to make the investment more viable, will have to be made. Logically, the option of looking at a regional market has some appeal. In addition to improved economics, it will serve to preserve and enhance access to facilities in other jurisdictions, may allow specialization in facility development and ultimately allow the most flexible, cost effective system. In the near term, the province will remain dependent on the facilities of others and likely will always require some export access. Morally and practically, this will require the allowance of imports.

The less rational but equally persuasive argument exists regarding the public concern about receiving other's waste. The public perceives that the import of potentially dangerous materials to be an unfair transfer of risk to them. This is magnified if the transfer is occurring from an area that is perceived as being richer (i.e. obtaining economic value from the wastes generation) or as having a poorer quality of life (i.e. is more polluted). It is further increased by the strong public concern about the risk of transporting these materials, even though such risks are small in relation to those normally accepted by society.

At this point, the Corporation is retaining the option of developing a system to serve regional markets. The strategic location of Manitoba may allow the provision of services on a commercial basis to Northern Ontario, Saskatchewan and perhaps the Northern Tier States. At the same time, current access to facilities in Ontario and the U.S. can be preserved. This gives the maximum flexibility in the type, scale and rate of development undertaken in the province. A policy of open borders will necessitate an open discussion of the issue as part of the process of developing public acceptance for specific facilities. Clarity and consistency of the policy position over a sustained period will be required.

With respect to market selectivity, little flexibility exists in the selection of wastes accepted by the system. The objective of dealing with the problem as a whole and the need to provide universal and equitable access precludes selecting only profitable wastes for management. However, the system should not be structured to be at a disadvantage in accessing profitable market opportunities. For these reasons, the points regarding the requirement of speciality operators to meet the same standards as the overall system and the allowance of a publicly sponsored system to participate in all aspects of the business are emphasized in this context.

REFERENCES

1. Government of Canada, Transportation of Dangerous Goods Regulations, SOR/85-77.

2. Lave, L. B.and Upton, A. C., Toxic Chemicals, Health, and the Environment, John Hopkins Press, Baltimore, 1987.

3. Proctor & Redfern Ltd., Resource Integration Systems Ltd.,Gore & Storrie Ltd.,Data on Hazardous Wastes,Rubber Wastes and Oil Wastes in Canada - 1983, Environment Canada, October 1984.

4. Yee, E.,Kucera, E. and Keleher, J. J., Hazardous Waste Management in Manitoba, Manitoba Environment and Workplace Safety and Health, July 1985.

5. Erstrin, D., Handle With Caution, Liability in the Production, Transportation and Disposal of Dangerous Substances, Carswell, Toronto, 1986.

6. McClure, J.E., Western Europeon Hazardous Waste Management Systems and Facilities, A Survey, Hazardous and Toxic Wastes, Majumdar, S.K. and Miller, E.W., Editors, Chapter 18, Page 265, 1984

7. Morrell,D. and Magorian, C., Siting Hazardous Waste Facilities, Local Opposition and the Myth of Preemption, Ballinger, Cambridge, 1982.

8. Environmental Protection Agency, Superfund: A Six Year Perspective, Washington, October 1986.

9. Environ Corporation, A New Course Under SARA, Environ Report, Washington, Fall 1987.

10. Hazardous Waste News, Volume 10, Number 16, P.155, 1988.

11. The Hazardous Waste Management Consultant, Volume 6, Number 2, Section 4, March/April 1988.

12. Ontario Waste Management Corporation, Draft Environmental Impact Assessment, Volume I, The OWMC Undertaking, February 1988.

13. Monenco Limited, Site Selection Process Phase 4A - Selection of Preferred Site(s), Engineering, Ontario Waste Management Corporation, 1986.

14. Stablex Canada Inc., Personal Communication, 1988.

15. Environment Council of Alberta, Public Hearings on Hazardous Waste Management in Alberta, Report and Recommendations, December 1980.

16. Alberta Environment, Hazardous Waste Management in Alberta, 1980.

17. McQuald-Cook, J. and Simpson, K. J. , Siting a Fully Integrated Hazardous Waste Management Facility In Alberta, Journal of the Air Pollution Control Association, Volume 36, Number 9, September 1986.

18. Chem-Security Ltd., Alberta Special Waste Treatment Centre, Environmental Protection Plan, July 1987.

19. Cox, K., Disposal Plant Becomes Costly For Alberta, Globe and Mail, May 31, 1988.

20. Joint Venture Agreement for the Construction, Ownership, and Operation of a Part of the Alberta Special Waste Management System, Chem-Security Ltd. and the Alberta Special Waste Management Corporation, 1986.

21. Struzik, E., $5.7 Million Bailout for Waste Plant, Edmonton Journal, February 27,1988.

22. Manitoba Hydro, Annual Report, P.17, 1987.

23. B.C. Special Waste Services Inc., Personal Communication., March 1988.

24. B.C. Special Waste Advisory Committee, Request for Proposals, July 1987.

25. B.C. Special Waste Services Inc., Proposal for: B.C. Special Waste Management Facility, Volume 1, September 1987.

26. Province of Nova Scotia, The Report on the Minister,s Task Force on Hazardous Waste Management, Nova Scotia Department of Environment, April 1987.

27. Saskatchewan Environment, Personal Communication.

28. Canadian Council of Resource and Environment Ministers, Draft PCB Action Plan, Final Report, October 1987.

29. Manitoba Clean Environment Commission, Report on Public Hearings, December 5,1983 - February 2,1984, 1984.

30. Manitoba Clean Environment Commission, Report on Public Hearings, November 12, 1986 - January 20, 1987, 1987.

31. Manitoba Environment and Workplace Safety and Health, Report on Manitoba Symposium on Hazardous and Special Waste, March 16, 17 and 18,1983, 1983.

32. IDS Ltd./Monenco Ltd., Hazardous Waste Management System Cost Analysis, Manitoba Environment and Workplace Safety and Health, April 1986.

33. Godavari, S. N., Bibliography: Hazardous Wastes Volume I, Manitoba Environment and Workplace Safety and Health, 1983.

34. Godavari, S. N., Bibliography: Hazardous Wastes _Volume II, Manitoba Environment and Workplace Safety and Health, 1985.

35. The Manitoba Hazardous Waste Management Corporation Act, S.M. 1986, C.10, November 1986.

36. Thompson, D. R., Household Hazardous Waste, Proceedings of 9th Canadian Conference on Waste Management, Page 59, October 1987.

37. Latonas, G. L., Discussion Document - Proposed Site Selection Process for the Development of a Hazardous Waste Management Facility, Manitoba Hazardous Waste Management Corporation, July 1988.

38. Ontario Waste Management Corporation, Personal Communication.

39. Watson T.A.G., Crisis Communication, 1st Annual Hazardous Materials Management Conference of Canada, Tower Conference Management, Toronto, September 1987.

40. Canadian Manufacturer's Association, Submission to the Manitoba Clean Environment Commission, December 1986.

41. Reid, Crowther & Partners Ltd., Hazardous Wastes in Northern and Western Canada: The Need for a Waste Management Strategy, Volume 3, Environment Canada, March 1981.

42. Armour, A., Social Impact Assessment of New Hazardous Waste Facilities, APCA Conference on Siting of Waste Management Facilities, St. Louis, March 1988.

43. Brydon, B., Citizen's Guide to Hazardous Waste in British Columbia, British Columbia Public Interest
Research Group, 1984.

44. Jackson, J., Toxic Waste Research Coalition, January, 1988

45. State of New York, Hazardous Waste Facility Siting: A National Survey, Legislative Commission on Toxic Substances and Hazardous Wastes, June 1987.

46. Government of Canada, Canadian Environmental Protection Act, 1988.

47. Wolf. K., Source Reduction and Waste Management Hierarchy, Journal of the American Pollution Control Association, Volume 38, No.5, May 1988.

48. Kucera, E., Guide to Manitoba's Hazardous Waste Legislation, Manitoba Environment and Workplace Safety and Health, March 1988.